



# Analytical Laboratory

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13339 Hagers Ferry Road  
Huntersville, NC 28078-7929  
McGuire Nuclear Complex - MG03A2  
Phone: 980-875-5245 Fax: 980-875-4349

## Order Summary Report

**Order Number:** J11050020

**Customer Name(s):** Bill Kennedy, Melonie Martin, Wayne Chapman, Tom Johnson

**Customer Address:** 3195 Pine Hall Rd  
Mailcode: Belews Steam Station  
Belews Creek, NC 28012

**Lab Contact:** Jason C Perkins **Phone:** 980-875-5348

**Report Authorized By:** \_\_\_\_\_ **Date:** 5/26/2011  
**(Signature)**

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### Program Comments:

FGD BiMonthly

### Data Flags & Calculations:

Any analytical tests or individual analytes within a test flagged with an "X" or "1" indicate a deviation from the method quality system or quality control requirement. All results are reported on a dry weight basis unless otherwise noted.

### Data Package:

This data package includes analytical results that are applicable only to the samples described in this narrative. An estimation of the uncertainty of measurement for the results in the report is available upon request. This report shall not be reproduced, except in full, without the written consent of the Analytical Laboratory. Please contact the Analytical laboratory with any questions. The order of individual sections within this report is as follows:

*Job Summary Report, Sample Identification, Technical Validation of Data Package, Analytical Laboratory Certificate of Analysis, Analytical Laboratory QC Reports, Sub-contracted Laboratory Results, Customer Specific Data Sheets, Reports & Documentation, Customer Database Entries, Test Case Narratives, Chain of Custody (COC)*

### Certification:

The Analytical Laboratory holds the following State Certifications : North Carolina (DENR) Certificate #248, South Carolina (DHEC) Laboratory ID # 99005. Contact the Analytical Laboratory for definitive information about the certification status of specific methods.

**Sample ID's & Descriptions:**

Sample ID	Plant/Station	Collection Date and Time	Collected By	Sample Description
2011009703	BELEWS	11-May-11 8:00 AM	Tim Owens	FGD Purge Eff
2011009704	BELEWS	11-May-11 8:00 AM	Tim Owens	EQ TANK EFF.
2011009705	BELEWS	11-May-11 8:00 AM	Tim Owens	BIOREACTOR 1 INF.
2011009706	BELEWS	11-May-11 8:00 AM	Tim Owens	BIOREACTOR 2 INF.
2011009707	BELEWS	11-May-11 8:00 AM	Tim Owens	BIOREACTOR 2 EFF.
2011009708	BELEWS	03-May-11 8:00 AM	L.DAVIS	FILTER BLANK
2011009709	BELEWS	03-May-11 8:00 AM	L.DAVIS	Trip Blank
2011009715	BELEWS	11-May-11 8:00 AM	Tim Owens	BIOREACTOR 1 INF.
2011009723	BELEWS	11-May-11 8:00 AM	Tim Owens	HG BLANK BIOREACTOR 1 INF.
2011009724	BELEWS	11-May-11 8:00 AM	Tim Owens	BIOREACTOR 2 INF.
2011009725	BELEWS	11-May-11 8:00 AM	Tim Owens	Hg Blk BioReactor 2 Inf
2011009726	BELEWS	11-May-11 8:00 AM	Tim Owens	BIOREACTOR 2 EFF.
2011009727	BELEWS	11-May-11 8:00 AM	Tim Owens	Hg Blk BioReactor 2 Eff
13 Total Samples				

# Technical Validation Review

## Checklist:

COC and .pdf report are in agreement with sample totals and analyses (compliance programs and procedures).

☒ Yes

☐ No

All Results are less than the laboratory reporting limits.

☐ Yes

☒ No

All laboratory QA/QC requirements are acceptable.

☒ Yes

☐ No

The Vendor Laboratories have been qualified by the Analytical Laboratory

Yes

## Report Sections Included:

☒ Job Summary Report

☒ Sample Identification

☒ Technical Validation of Data Package

☒ Analytical Laboratory Certificate of Analysis

☐ Analytical Laboratory QC Report

☒ Sub-contracted Laboratory Results

☐ Customer Specific Data Sheets, Reports, & Documentation

☐ Customer Database Entries

☐ Test Case Narratives

☒ Chain of Custody

☐ Electronic Data Deliverable (EDD) Sent Separately

Reviewed By: Mary Ann Ogle

Date: 5/26/2011

**Certificate of Laboratory Analysis***This report shall not be reproduced, except in full.***Order # J11050020**

Site: FGD Purge Eff

Collection Date: 11-May-11 8:00 AM

**Sample #: 2011009703**

Matrix: OTHER

Analyte	Result	Units	Qualifiers	RDL	Method	Analysis Date/Time	Analyst
<b><u>MERCURY (COLD VAPOR) IN WATER</u></b>							
Mercury (Hg)	183	ug/L		5	EPA 245.1	23-May-11 16:00	TLINN
<b><u>TOTAL RECOVERABLE METALS BY ICP</u></b>							
Boron (B)	159	mg/L		0.5	EPA 200.7	13-May-11 12:26	DJSULL1
<b><u>DISSOLVED METALS BY ICP-MS</u></b>							
Selenium (Se)	4460	ug/L		10	EPA 200.8	19-May-11 14:38	KRICHAR
<b><u>TOTAL RECOVERABLE METALS BY ICP-MS</u></b>							
Arsenic (As)	214	ug/L		10	EPA 200.8	18-May-11 13:57	KRICHAR
Chromium (Cr)	293	ug/L		10	EPA 200.8	18-May-11 13:57	KRICHAR
Copper (Cu)	256	ug/L		10	EPA 200.8	18-May-11 13:57	KRICHAR
Nickel (Ni)	284	ug/L		10	EPA 200.8	18-May-11 13:57	KRICHAR
Selenium (Se)	5550	ug/L		20	EPA 200.8	18-May-11 13:57	KRICHAR
Silver (Ag)	< 10	ug/L		10	EPA 200.8	18-May-11 13:57	KRICHAR
Zinc (Zn)	430	ug/L		20	EPA 200.8	18-May-11 13:57	KRICHAR
<b><u>SELENIUM SPECIATION</u></b>							
Vendor Parameter	Complete				V_AS&C		
<b><u>TOTAL DISSOLVED SOLIDS</u></b>							
TDS	24000	mg/L		200	SM2540C	12-May-11 16:50	TJA7067

Site: EQ TANK EFF.

Collection Date: 11-May-11 8:00 AM

**Sample #: 2011009704**

Matrix: OTHER

Analyte	Result	Units	Qualifiers	RDL	Method	Analysis Date/Time	Analyst
<b><u>MERCURY (COLD VAPOR) IN WATER</u></b>							
Mercury (Hg)	151	ug/L		2.5	EPA 245.1	23-May-11 16:02	TLINN
<b><u>TOTAL RECOVERABLE METALS BY ICP</u></b>							
Boron (B)	167	mg/L		0.5	EPA 200.7	13-May-11 12:30	DJSULL1
<b><u>DISSOLVED METALS BY ICP-MS</u></b>							
Selenium (Se)	3820	ug/L		10	EPA 200.8	19-May-11 14:42	KRICHAR
<b><u>TOTAL RECOVERABLE METALS BY ICP-MS</u></b>							
Arsenic (As)	181	ug/L		10	EPA 200.8	18-May-11 13:53	KRICHAR
Chromium (Cr)	255	ug/L		10	EPA 200.8	18-May-11 13:53	KRICHAR
Copper (Cu)	221	ug/L		10	EPA 200.8	18-May-11 13:53	KRICHAR
Nickel (Ni)	271	ug/L		10	EPA 200.8	18-May-11 13:53	KRICHAR

# Certificate of Laboratory Analysis

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Order # J11050020

Site: EQ TANK EFF.

Collection Date: 11-May-11 8:00 AM

Sample #: 2011009704

Matrix: OTHER

Analyte	Result	Units	Qualifiers	RDL	Method	Analysis Date/Time	Analyst
<b>TOTAL RECOVERABLE METALS BY ICP-MS</b>							
Selenium (Se)	4800	ug/L		10	EPA 200.8	18-May-11 13:53	KRICHAR
Silver (Ag)	< 10	ug/L		10	EPA 200.8	18-May-11 13:53	KRICHAR
Zinc (Zn)	391	ug/L		20	EPA 200.8	18-May-11 13:53	KRICHAR

Site: BIOREACTOR 1 INF.

Collection Date: 11-May-11 8:00 AM

Sample #: 2011009705

Matrix: OTHER

Analyte	Result	Units	Qualifiers	RDL	Method	Analysis Date/Time	Analyst
<b>TOTAL RECOVERABLE METALS BY ICP</b>							
Boron (B)	164	mg/L		0.5	EPA 200.7	13-May-11 12:34	DJSULL1

## **DISSOLVED METALS BY ICP-MS**

Selenium (Se)	114	ug/L		10	EPA 200.8	19-May-11 14:45	KRICHAR
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## **TOTAL RECOVERABLE METALS BY ICP-MS**

Arsenic (As)	< 10	ug/L		10	EPA 200.8	18-May-11 13:48	KRICHAR
Chromium (Cr)	< 10	ug/L		10	EPA 200.8	18-May-11 13:48	KRICHAR
Copper (Cu)	< 10	ug/L		10	EPA 200.8	18-May-11 13:48	KRICHAR
Nickel (Ni)	40.7	ug/L		10	EPA 200.8	18-May-11 13:48	KRICHAR
Selenium (Se)	111	ug/L		10	EPA 200.8	18-May-11 13:48	KRICHAR
Silver (Ag)	< 10	ug/L		10	EPA 200.8	18-May-11 13:48	KRICHAR
Zinc (Zn)	< 20	ug/L		20	EPA 200.8	18-May-11 13:48	KRICHAR

## **SELENIUM SPECIATION**

Vendor Parameter	Complete	V_AS&C
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Site: BIOREACTOR 2 INF.

Collection Date: 11-May-11 8:00 AM

Sample #: 2011009706

Matrix: OTHER

Analyte	Result	Units	Qualifiers	RDL	Method	Analysis Date/Time	Analyst
<b>TOTAL RECOVERABLE METALS BY ICP</b>							
Boron (B)	166	mg/L		0.5	EPA 200.7	13-May-11 12:38	DJSULL1

## **TOTAL RECOVERABLE METALS BY ICP-MS**

Arsenic (As)	< 10	ug/L		10	EPA 200.8	18-May-11 13:43	KRICHAR
Chromium (Cr)	< 10	ug/L		10	EPA 200.8	18-May-11 13:43	KRICHAR
Copper (Cu)	< 10	ug/L		10	EPA 200.8	18-May-11 13:43	KRICHAR
Nickel (Ni)	< 10	ug/L		10	EPA 200.8	18-May-11 13:43	KRICHAR
Selenium (Se)	40.3	ug/L		10	EPA 200.8	18-May-11 13:43	KRICHAR
Silver (Ag)	< 10	ug/L		10	EPA 200.8	18-May-11 13:43	KRICHAR
Zinc (Zn)	< 20	ug/L		20	EPA 200.8	18-May-11 13:43	KRICHAR

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**Order # J11050020**

**Sample #:** 2011009707

Matrix: OTHER

## SELENIUM SPECIATION

V\_AS&amp;C

**Sample #:** 2011009708

Matrix: OTHER

## DISSOLVED METALS BY ICP-MS

**Sample #:** 2011009709

Matrix: OTHER

**TOTAL RECOVERABLE METALS BY ICP**

DJSULL1

### TOTAL RECOVERABLE METALS BY ICP-MS

KRICHAR

KRICHAR

KRICHAR

KRICHAR

KRICHAR

KRICHAR

KRICHAR

## SELENIUM SPECIATION

# Certificate of Laboratory Analysis

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Order # J11050020

Site: Trip Blank

Collection Date: 03-May-11 8:00 AM

Sample #: 2011009709

Matrix: OTHER

Analyte	Result	Units	Qualifiers	RDL	Method	Analysis Date/Time	Analyst
<b><u>SELENIUM SPECIATION</u></b>							
Vendor Parameter	Complete				V_AS&C		

Site: BIOREACTOR 1 INF.

Collection Date: 11-May-11 8:00 AM

Sample #: 2011009715

Matrix: OTHER

Analyte	Result	Units	Qualifiers	RDL	Method	Analysis Date/Time	Analyst
<b><u>MERCURY 1631</u></b>							
Mercury (Hg)	Complete	ng/L		1	V_BRAND		

Site: HG BLANK BIOREACTOR 1 INF.

Collection Date: 11-May-11 8:00 AM

Sample #: 2011009723

Matrix: OTHER

Analyte	Result	Units	Qualifiers	RDL	Method	Analysis Date/Time	Analyst
<b><u>MERCURY 1631</u></b>							
Mercury (Hg)	Complete	ng/L		1	V_BRAND		

Site: BIOREACTOR 2 INF.

Collection Date: 11-May-11 8:00 AM

Sample #: 2011009724

Matrix: OTHER

Analyte	Result	Units	Qualifiers	RDL	Method	Analysis Date/Time	Analyst
<b><u>MERCURY 1631</u></b>							
Mercury (Hg)	Complete	ng/L		1	V_BRAND		

Site: Hg Blk BioReactor 2 Inf

Collection Date: 11-May-11 8:00 AM

Sample #: 2011009725

Matrix: OTHER

Analyte	Result	Units	Qualifiers	RDL	Method	Analysis Date/Time	Analyst
<b><u>MERCURY 1631</u></b>							
Mercury (Hg)	Complete	ng/L		1	V_BRAND		

Site: BIOREACTOR 2 EFF.

Collection Date: 11-May-11 8:00 AM

Sample #: 2011009726

Matrix: OTHER

Analyte	Result	Units	Qualifiers	RDL	Method	Analysis Date/Time	Analyst
<b><u>MERCURY 1631</u></b>							
Mercury (Hg)	Complete	ng/L		1	V_BRAND		

# Certificate of Laboratory Analysis

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**Order # J11050020**

Site: Hg Blk BioReactor 2 Eff

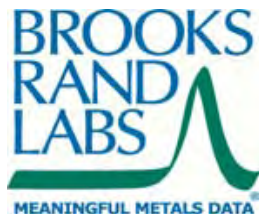
Collection Date: 11-May-11 8:00 AM

**Sample #:** 2011009727

Matrix: OTHER

Analyte	Result	Units	Qualifiers	RDL	Method	Analysis Date/Time	Analyst
<b><u>MERCURY 1631</u></b>							
Mercury (Hg)	<b>Complete</b>	ng/L		1	V_BRAND		





May 20, 2011

Duke Energy  
ATTN: Jay Perkins  
13339 Hagers Ferry Road  
Huntersville NC 28078  
jperkins@duke-energy.com

RE: Project DUK-HV1101

Dear Jay Perkins,

This report contains results for the 6 samples received by Brooks Rand Labs (BRL) on May 13, 2011. The samples were logged-in for the contracted analyses according to the chain-of-custody form(s). The samples were received, prepared, analyzed, and stored according to BRL SOPs and EPA methodology.

The results were method blank corrected as described in the calculations section of the relevant BRL SOP(s) and may have been evaluated using reporting limits that have been adjusted to account for sample aliquot size. Please refer to the *Sample Results* page for sample-specific MDLs, MRLs, and other details. All data is reported without qualification (with the exception of concentration qualifiers), and all associated quality control sample results meet the acceptance criteria.

BRL, an accredited laboratory, certifies that the reported results of all analyses for which BRL is NELAP accredited meet all NELAP requirements. For more details, please see the *Report Information* page in your report. Please feel free to contact me if you have any questions regarding this report.

Sincerely,

Tiffany Stilwater  
Project Manager  
tiffany@brooksrands.com

## Report Information

### Laboratory Accreditation

BRL is accredited by the *National Environmental Laboratory Accreditation Program* (NELAP) through the State of Florida Department of Health, Bureau of Laboratories (E87982) and is certified to perform many environmental analyses. BRL is also certified by many other states to perform environmental analyses. For a current list of our accreditations/certifications, please visit our website at <http://www.brooksrand.com/default.asp?contentID=586>. Results reported relate only to the samples listed in the report.

### Field Quality Control Samples

Please be notified that certain EPA methods require the collection of field quality control samples of an appropriate type and frequency; failure to do so is considered a deviation from some methods and for compliance purposes should only be done with the approval of regulatory authorities. Please see the specific EPA methods for details regarding required field quality control samples.

### Common Abbreviations

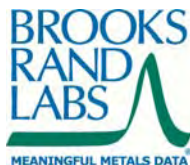
<b>BLK</b>	method blank	<b>MS</b>	matrix spike
<b>BRL</b>	Brooks Rand Labs	<b>MSD</b>	matrix spike duplicate
<b>BS</b>	laboratory fortified blank	<b>ND</b>	non-detect
<b>CAL</b>	calibration standard	<b>NR</b>	non-reportable
<b>CCV</b>	continuing calibration verification	<b>PS</b>	post preparation spike
<b>COC</b>	chain of custody record	<b>REC</b>	percent recovery
<b>CRM</b>	certified reference material	<b>RPD</b>	relative percent difference
<b>D</b>	dissolved fraction	<b>RSD</b>	relative standard deviation
<b>DUP</b>	duplicate	<b>SCV</b>	secondary calibration verification
<b>ICV</b>	initial calibration verification	<b>SOP</b>	standard operating procedure
<b>MDL</b>	method detection limit	<b>SRM</b>	standard reference material
<b>MRL</b>	method reporting limit	<b>T</b>	total recoverable fraction

### Definition of Data Qualifiers

(Effective 9/23/09)

<b>B</b>	Detected by the instrument, the result is > the MDL but ≤ the MRL. Result is reported and considered an estimate.
<b>E</b>	An estimated value due to the presence of interferences. A full explanation is presented in the narrative.
<b>H</b>	Holding time and/or preservation requirements not met. Result is estimated.
<b>J</b>	Estimated value. A full explanation is presented in the narrative.
<b>J-M</b>	Duplicate precision (RPD) for associated QC sample was not within acceptance criteria. Result is estimated.
<b>J-N</b>	Spike recovery for associated QC sample was not within acceptance criteria. Result is estimated.
<b>M</b>	Duplicate precision (RPD) was not within acceptance criteria. Result is estimated.
<b>N</b>	Spike recovery was not within acceptance criteria. Result is estimated.
<b>R</b>	Rejected, unusable value. A full explanation is presented in the narrative.
<b>U</b>	Result is ≤ the MDL or client requested reporting limit (CRRL). Result reported as the MDL or CRRL.
<b>X</b>	Result is not BLK-corrected and is within 10x the absolute value of the highest detectable BLK in the batch. Result is estimated.

These qualifiers are based on those previously utilized by Brooks Rand, Ltd., those found in the EPA SOW ILM03.0, Exhibit B, Section III, pg. B-18, and the USEPA Laboratory Data Validation Functional Guidelines for Evaluating Inorganic Analyses; USEPA; July 2002. These supersede all previous qualifiers ever employed by BRL.

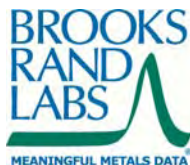


## Sample Information

Sample	Lab ID	Report Matrix	Type	Sampled	Received
BioReactor 1 Inf	1120032-01	FGD Wastewater	Sample	05/11/2011	05/13/2011
Hg Blk BioReactor 1 Inf	1120032-02	DIW	Field Blank	05/11/2011	05/13/2011
BioReactor 2 Inf	1120032-03	FGD Wastewater	Sample	05/11/2011	05/13/2011
Hg Blk BioReactor 2 Inf	1120032-04	DIW	Field Blank	05/11/2011	05/13/2011
BioReactor 2 Eff	1120032-05	FGD Wastewater	Sample	05/11/2011	05/13/2011
Hg Blk BioReactor 2 Eff	1120032-06	DIW	Field Blank	05/11/2011	05/13/2011

## Batch Summary

Analyte	Lab Matrix	Method	Prepared	Analyzed	Batch	Sequence
Hg	Water	EPA 1631	05/16/2011	05/19/2011	B110676	1100332



## Sample Results

Sample	Analyte	Report Matrix	Fraction	Result	Qualifier	MDL	MRL	Unit	Batch	Sequence
<b>BioReactor 1 Inf</b>										
1120032-01	Hg	FGD Wastewater	T	101		1.52	4.04	ng/L	B110676	1100332
<b>BioReactor 2 Eff</b>										
1120032-05	Hg	FGD Wastewater	T	8.65		0.30	0.80	ng/L	B110676	1100332
<b>BioReactor 2 Inf</b>										
1120032-03	Hg	FGD Wastewater	T	44.1		1.52	4.04	ng/L	B110676	1100332
<b>Hg Blk BioReactor 1 Inf</b>										
1120032-02	Hg	DIW	T	0.15	U	0.15	0.41	ng/L	B110676	1100332
<b>Hg Blk BioReactor 2 Eff</b>										
1120032-06	Hg	DIW	T	0.15	U	0.15	0.41	ng/L	B110676	1100332
<b>Hg Blk BioReactor 2 Inf</b>										
1120032-04	Hg	DIW	T	0.15	U	0.15	0.40	ng/L	B110676	1100332

## Accuracy & Precision Summary

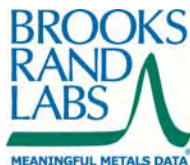
Batch: B110676  
Lab Matrix: Water  
Method: EPA 1631

Sample	Analyte	Native	Spike	Result	Units	REC & Limits	RPD & Limits
B110676-SRM1	Certified Reference Material (1120043, NIST 1641d 1000x dilution)						
	Hg		15.68	16.09	ng/L	103% 85-115	
B110676-MS2	Matrix Spike (1120032-03)						
	Hg	44.08	212.1	286.0	ng/L	114% 71-125	
B110676-MSD2	Matrix Spike Duplicate (1120032-03)						
	Hg	44.08	212.1	277.3	ng/L	110% 71-125	3% 24

## Method Blanks & Reporting Limits

Batch: B110676  
Matrix: Water  
Method: EPA 1631  
Analyte: Hg

Sample	Result	Units
B110676-BLK1	0.13	ng/L
B110676-BLK2	0.11	ng/L
B110676-BLK3	0.08	ng/L
B110676-BLK4	0.04	ng/L
Average: 0.09		Standard Deviation: 0.04
Limit: 0.50		MDL: 0.15
		Limit: 0.10
		MRL: 0.41



## Instrument Calibration

Sequence: 1100332  
Instrument: THG-05  
Date: 05/19/2011  
Analyte: Hg

Total Mercury and Mercury Speciation by CVAFS  
Method: EPA 1631

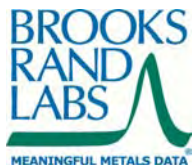
Lab ID	True Value	Result	Units	REC & Limits	
1100332-CAL1	25.00	23.18	pg of Hg	93%	
1100332-CAL2	100.0	97.42	pg of Hg	97%	
1100332-CAL3	500.0	511.6	pg of Hg	102%	
1100332-CAL4	2500	2581	pg of Hg	103%	
1100332-CAL5	10000	10530	pg of Hg	105%	
1100332-CCB1		16.0	pg of Hg		
1100332-CCV1	500.0	528.3	pg of Hg	106%	77-123
1100332-CCV2	500.0	514.8	pg of Hg	103%	77-123
1100332-CCV3	500.0	539.8	pg of Hg	108%	77-123
1100332-IBL1		10.47	pg of Hg		
1100332-IBL2		9.81	pg of Hg		
1100332-IBL3		11.16	pg of Hg		
1100332-IBL4		10.23	pg of Hg		
1100332-ICV1	1568	1609	pg of Hg	103%	85-115



## Sample Containers

Lab ID: 1120032-01		Report Matrix: FGD Wastewater				Collected: 05/11/2011	
Sample: BioReactor 1 Inf		Sample Type: Sample				Received: 05/13/2011	
Des	Container	Size	Lot	Preservation	P-Lot	pH	Ship. Cont.
A	Bottle Glass	500 mL	No Lot #	None	N/A		Cooler
Lab ID: 1120032-02		Report Matrix: DIW				Collected: 05/11/2011	
Sample: Hg Blk BioReactor 1 Inf		Sample Type: Field Blank				Received: 05/13/2011	
Des	Container	Size	Lot	Preservation	P-Lot	pH	Ship. Cont.
A	Bottle Glass	500 mL	No Lot #	None	N/A		Cooler
Lab ID: 1120032-03		Report Matrix: FGD Wastewater				Collected: 05/11/2011	
Sample: BioReactor 2 Inf		Sample Type: Sample				Received: 05/13/2011	
Des	Container	Size	Lot	Preservation	P-Lot	pH	Ship. Cont.
A	Bottle Glass	500 mL	No Lot #	None	N/A		Cooler
Lab ID: 1120032-04		Report Matrix: DIW				Collected: 05/11/2011	
Sample: Hg Blk BioReactor 2 Inf		Sample Type: Field Blank				Received: 05/13/2011	
Des	Container	Size	Lot	Preservation	P-Lot	pH	Ship. Cont.
A	Bottle Glass	500 mL	No Lot #	None	N/A		Cooler
Lab ID: 1120032-05		Report Matrix: FGD Wastewater				Collected: 05/11/2011	
Sample: BioReactor 2 Eff		Sample Type: Sample				Received: 05/13/2011	
Des	Container	Size	Lot	Preservation	P-Lot	pH	Ship. Cont.
A	Bottle Glass	500 mL	No Lot #	None	N/A		Cooler
Lab ID: 1120032-06		Report Matrix: DIW				Collected: 05/11/2011	
Sample: Hg Blk BioReactor 2 Eff		Sample Type: Field Blank				Received: 05/13/2011	
Des	Container	Size	Lot	Preservation	P-Lot	pH	Ship. Cont.
A	Bottle Glass	500 mL	No Lot #	None	N/A		Cooler

**Project ID:** DUK-HV1101  
**PM:** Tiffany Stilwater



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**Client PM:** Jay Perkins  
**Client PO:** 141391

## Shipping Containers

### Cooler

**Received:** May 13, 2011 8:45  
**Tracking No:** 4726 7966 0403 via FedEx  
**Coolant Type:** None  
**Temperature:** ambient

**Description:** Cooler  
**Damaged in transit?** No  
**Returned to client?** No

**Custody seals present?** No  
**Custody seals intact?** No  
**COC present?** Yes



## CHAIN OF CUSTODY RECORD AND ANALYSIS REQUEST FORM 1120032

**Duke Energy**

**Duke Energy Analytical Laboratory**  
Mail Code MGO3A2 (Building 7405)  
13339 Hagers Ferry Rd  
Huntersville, N. C. 28078  
(704) 876-5245  
Fax: (704) 876-4349

Analytical Laboratory Use Only

Page 17 of 27

<sup>19</sup>Page 2 of 2

DISTRIBUTION  
ORIGINAL to LAB  
COPY to CLIENT

1)Project Name	Belews - FGD		2)Phone No:
2) Client:	Bill Kennedy, Melonie Martin, Wayne Chapman, Tom Johnson *		4)Fax No:
5)Business Unit:	6)Process:	Mail Code:	
8)Oper. Unit:	9)Res. Type:	10)Reso. Center:	

Brooks Rand  
ISW01.1948

Cooler Temp (C)

1=Preserv.:1=HCL  
2=H<sub>2</sub>SO<sub>4</sub> 3=HNO<sub>3</sub>  
4=Ice 5=None

Customer to complete all appropriate non-shaded areas.

**Analyses Required**

<sup>17</sup>Comp.

451631	5
(Sample 2nd sk)	

LAB USE ONLY

<sup>11</sup>Lab ID

2011009715

723

724

725

726

727

[illegible]

1) Relinquished By <i>[Signature]</i>	Date/Time 5/11/11 09:15	2) Accepted By <i>[Signature]</i>	Date/Time 5-11-11 1145
3) Relinquished By <i>[Signature]</i>	Date/Time 5-11-11 1210	4) Accepted By <i>[Signature]</i>	Date/Time 5-11-11 1210
6) Relinquished By <i>[Signature]</i>	Date/Time 5-11-11 2345	8) Accepted By <i>[Signature]</i>	Date/Time 5-11-11 1245
7) Relinquished By <i>[Signature]</i>	Date/Time 5/12/11 1430	8) Accepted By <i>[Signature]</i>	Date/Time 5/13/11 0845
9) Seal/Locked By <i>[Signature]</i>	Date/Time 5/11/11 1535	10) Seal/Lock Opened By	Date/Time
11) Seal/Locked By	Date/Time	12) Seal/Lock Opened By	Date/Time

<sup>22</sup>Requested Turnaround

14 Days \_\_\_\_\_

\*7 Days

\* 48 Hr

\*Other: 5/22/1

\* Add. Cost Will Apply

\*Metals=As, Ag, B, Cu, Cr, Ni, Se, Zn

\*thomas.d.johnson@siemens.com



**APPLIED SPECIATION  
AND CONSULTING, LLC**

18804 Northcreek Parkway Bothell, WA, 98011  
Tel: (425) 483-3300 Fax: (425) 483-9818  
[www.appliedspeciation.com](http://www.appliedspeciation.com)

May 19, 2011

Jay Perkins  
Duke Energy Analytical Laboratory  
Mail Code MGO3A2 (Building 7405)  
13339 Hagers Ferry Rd.  
Huntersville, NC 28078  
(704) 875-5245

Project: Belews - FGD WWTS (2010, Bi-Weekly Sampling) (LIMS # J11050020)

Dear Mr. Perkins,

Attached is the report associated with four (4) aqueous samples submitted for selenium speciation analysis on May 11, 2011. The samples were received on May 13, 2011 in a sealed cooler at 0.0°C. Selenium speciation analysis was performed via ion chromatography inductively coupled plasma dynamic reaction cell mass spectrometry (IC-ICP-DRC-MS). Any issues associated with the analysis are addressed in the following report.

If you have any questions, please feel free to contact me at your convenience.

Sincerely,

A handwritten signature in black ink that reads "Ben Wozniak".

Ben Wozniak  
Project Manager  
Applied Speciation and Consulting, LLC

Applied Speciation and Consulting, LLC

Report prepared for:

Jay Perkins  
Duke Energy Analytical Laboratory  
Mail Code MGO3A2 (Building 7405)  
13339 Hagers Ferry Rd.  
Huntersville, NC 28078

Project: Belews - FGD WWTS (2010, Bi-Weekly Sampling) (LIMS # J11050020)

May 19, 2011

## 1. Sample Reception

Four (4) aqueous samples in 125mL HDPE bottles (provided by Applied Speciation and Consulting) were submitted for selenium speciation analysis on May 11, 2011. The samples were received on May 13, 2011 in a sealed container at 0.0°C.

The samples were received in a laminar flow clean hood void of trace metals contamination and ultra-violet radiation. Upon reception, the samples were designated discrete sample identifiers. An aliquot of each sample was filtered (0.45µm) and these filtrates were stored in a secure, monitored cryofreezer (maintained at a temperature of -80°C) until selenium speciation analysis could be performed via ion chromatography inductively coupled plasma dynamic reaction cell mass spectrometry (IC-ICP-DRC-MS).

## 2. Sample Preparation

All sample preparation is performed in laminar flow clean hoods known to be free from trace metals contamination. All applied water for dilutions and sample preservatives are monitored for contamination to account for any biases associated with the sample results.

Selenium Speciation Analysis by IC-ICP-DRC-MS Prior to analysis, an aliquot of each sample was filtered with a syringe filter (0.45µm) and injected directly into a sealed autosampler vial. No further sample preparation was performed as any chemical alteration of the samples may shift the equilibrium of the system resulting in changes in speciation ratios.

## 3. Sample Analysis

All sample analysis is precluded by a minimum of a five-point calibration curve spanning the entire concentration range of interest. Calibration curves are performed at the beginning of each analytical day. All calibration curves, associated with each species of interest, are

standardized by linear regression resulting in a response factor. All sample results are **instrument blank corrected** to account for any operational biases associated with the analytical platform.

Prior to sample analysis, all calibration curves are verified using second source standards which are identified as initial calibration verification standards (ICV).

Ongoing instrument performance is identified by the analysis of continuing calibration verification standards (CCV) and continuing calibration blanks (CCB) at a minimal interval of every ten analytical runs.

*Selenium Speciation Analysis by IC-ICP-DRC-MS* All samples for selenium speciation analysis were analyzed by ion chromatography inductively coupled plasma dynamic reaction cell mass spectrometry (IC-ICP-DRC-MS) on May 18, 2011. An aliquot of each sample is injected onto an anion exchange column and mobilized by a basic ( $\text{pH} > 7$ ) gradient. The eluting selenium species are then introduced into a radio frequency (RF) plasma where energy-transfer processes cause desolvation, atomization, and ionization. The ions are extracted from the plasma through a differentially-pumped vacuum interface and travel through a pressurized chamber (DRC) containing a specific reactive gas which preferentially reacts with interfering ions of the same target mass to charge ratios ( $m/z$ ). A solid-state detector detects ions transmitted through the mass analyzer and the resulting current is processed by a data handling system.

Retention times for each eluting species are compared to known standards for species identification.

#### 4. Analytical Issues

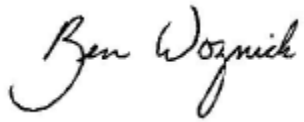
The overall analyses went very well and no analytical issues were encountered. All sample results have been corrected in accordance with the continuing calibration verification recoveries to account for perceived instrument drift. All quality control parameters associated with these samples were within acceptance limits, demonstrating the suitability of these corrections.

The estimated method detection limits (eMDLs) for selenite, selenate, and selenocyanate are generated from replicate analyses of the lowest standard in the calibration curve. Not all selenium species are present in preparation blanks; therefore, eMDL calculations based on preparation blanks are artificially biased low.

The eMDL for methylseleninic acid and selenomethionine is calculated from the average eMDL of selenite, selenate, and selenocyanate. The calibration does not contain methylseleninic acid or selenomethionine due to impurities in these standards which would bias the results for other selenium species.

If you have any questions or concerns regarding this report, please feel free to contact me.

Sincerely,

A handwritten signature in black ink that reads "Ben Wozniak". The signature is written in a cursive style with a large, looping "B" and a trailing flourish.

Ben Wozniak  
Project Manager  
Applied Speciation and Consulting, LLC

Selenium Speciation Results for Duke Energy  
Project Name: Belews - FGD WWTS (2010, Bi-Weekly Sampling)  
Contact: Jay Perkins  
LIMS #J11050020

Date: May 19, 2011  
Report Generated by: Ben Wozniak  
Applied Speciation and Consulting, LLC

**Sample Results**

Sample ID	Se(IV)	Se(VI)	SeCN	MeSe(IV)	SeMe	Unknown Se Species (n)
FGD Purge Eff	94.2	88.8	ND (<2.0)	ND (<1.5)	ND (<1.5)	0 (0)
Bioreactor 1 Inf	9.41	84.6	ND (<0.50)	1.81	ND (<0.38)	0 (0)
Bioreactor 2 Eff	ND (<0.27)	ND (<0.37)	ND (<0.50)	ND (<0.38)	ND (<0.38)	0 (0)
Metals Trip Blk	ND (<0.055)	ND (<0.073)	ND (<0.10)	ND (<0.076)	ND (<0.076)	0 (0)

All results reflect the applied dilution and are reported in µg/L

ND = Not detected at the applied dilution

SeCN = Selenocyanate

MeSe(IV) = Methylseleninic acid

SeMe = Selenomethionine

Unknown Se Species = Total concentration of all unknown Se species observed by IC-ICP-MS

n = number of unknown Se species observed

Selenium Speciation Results for Duke Energy  
Project Name: Belews - FGD WWTS (2010, Bi-Weekly Sampling)  
Contact: Jay Perkins  
LIMS #J11050020

Date: May 19, 2011  
Report Generated by: Ben Wozniak  
Applied Speciation and Consulting, LLC

**Quality Control Summary - Preparation Blank Summary**

Analyte (µg/L)	PBW1	PBW2	PBW3	PBW4	Mean	StdDev	eMDL*	eMDL 10x	eMDL 50x	eMDL 200x
Se(IV)	0.000	0.000	0.000	0.000	0.000	0.000	0.005	0.055	0.27	1.1
Se(VI)	0.000	0.000	0.000	0.000	0.000	0.000	0.007	0.073	0.37	1.5
SeCN	0.000	0.000	0.000	0.000	0.000	0.000	0.010	0.10	0.50	2.0
MeSe(IV)	0.000	0.000	0.000	0.000	0.000	0.000	0.008	0.076	0.38	1.5
SeMe	0.000	0.000	0.000	0.000	0.000	0.000	0.008	0.076	0.38	1.5

eMDL = Estimated Method Detection Limit

\*Please see narrative regarding eMDL calculations

**Quality Control Summary - Certified Reference Materials**

Analyte (µg/L)	CRM	True Value	Result	Recovery
Se(IV)	ICV	9.57	9.39	98.1
Se(VI)	ICV	9.48	9.04	95.4
SeCN	ICV	8.92	8.88	99.6
MeSe(IV)	ICV	6.47	5.41	83.6
SeMe	ICV	9.32	8.31	89.2

Selenium Speciation Results for Duke Energy  
Project Name: Belews - FGD WWTS (2010, Bi-Weekly Sampling)  
Contact: Jay Perkins  
LIMS #J11050020

Date: May 19, 2011  
Report Generated by: Ben Wozniak  
Applied Speciation and Consulting, LLC

**Quality Control Summary - Matrix Duplicates**

Analyte (µg/L)	Sample ID	Rep 1	Rep 2	Mean	RPD
Se(IV)	Bioreactor 2 Eff	ND (<0.27)	ND (<0.27)	NC	NC
Se(VI)	Bioreactor 2 Eff	ND (<0.37)	ND (<0.37)	NC	NC
SeCN	Bioreactor 2 Eff	ND (<0.50)	ND (<0.50)	NC	NC
MeSe(IV)	Bioreactor 2 Eff	ND (<0.38)	ND (<0.38)	NC	NC
SeMe	Bioreactor 2 Eff	ND (<0.38)	ND (<0.38)	NC	NC

ND = Not detected at the applied dilution

NC = Value was not calculated due to one or more concentrations below the eMDL

**Quality Control Summary - Matrix Spike/ Matrix Spike Duplicate**

Analyte (µg/L)	Sample ID	Spike Conc	MS Result	Recovery	Spike Conc	MSD Result	Recovery	RPD
Se(IV)	Bioreactor 2 Eff	278.0	264.1	95.0	278.0	267.4	96.2	1.2
Se(VI)	Bioreactor 2 Eff	252.3	246.4	97.7	252.3	246.4	97.7	0.0
SeCN	Bioreactor 2 Eff	228.8	214.2	93.6	228.8	215.3	94.1	0.5



# CHAIN OF CUSTODY RECORD AND ANALYSIS REQUEST FORM



## Duke Energy Analytical Laboratory

Mail Code MGO3A2 (Building 7405)  
13339 Hagers Ferry Rd  
Huntersville, N. C. 28078  
(704) 875-5245  
Fax: (704) 875-4349

## Analytical Laboratory Use Only

LIMS # **511050020** Sample Class **AS&C** Samples Originating From **NC** ☒ **SC** ☐  
Logged By **Am** Date & Time **5/11/11**  
Vendor **AS&C** PO# **ISW01.1894** Cooler Temp (C) **2.6**  
Vendor **AS&C** ID# **ISW01.1894** 15 Preserv.: 1=HCL 2=H<sub>2</sub>SO<sub>4</sub> 3=HNO<sub>3</sub> 4=Ice 5=None  
MR # **4** 3,4 **4** 3,4 **4**

Analytical Lab  
Page 25 of 27 of 2  
DISTRIBUTION  
ORIGINAL to LAB,  
COPY to CLIENT

1) Project Name **Belews - FGD** 2) Phone No:  
WWTS (2010, Bi-Weekly Sampling)  
2) Client: **Bill Kennedy, Melonie Martin, Wayne Chapman, Tom Johnson \*** 4) Fax No:  
5) Business Unit: 6) Process: Mail Code:  
8) Oper. Unit: 9) Res. Type: 10) Reso. Center:

Vendor: <del>PLS</del> <del>10W811413</del>			15 Preserv.: 1=HCL 2=H <sub>2</sub> SO <sub>4</sub> 3=HNO <sub>3</sub> 4=Ice 5=None			4 3,4		4 3,4				4		
MR #			16 Analyses Required		TDS		Hg - 245.1		Metals*		Se, soluble		Se, speciation - vendor to AS&C (Important to place filled bottle back into both baggies)	
Customer to complete all appropriate non-shaded areas.			17 Comp.		18 Grab									
Sampling conducted: 2nd and 4th Wednesday														
Date	Time	Signature												
5/11/11	0800	Tim Owens		✓	1	1		1	1				1	
5/11/11	0800	Tim Owens	✓			1		1	1					
5/11/11	0800	Tim Owens	✓						1	1			1	
5/11/11	0800	Tim Owens		✓				1						
5/11/11	0800	Tim Owens	✓			1		1					1	
5/3	0800	R. Davis		✓					1					
5/3	0800	R. Davis		✓					1				1	

## LAB USE ONLY

11 Lab ID

Se Speciation Bottle ID

13 Sample Description or ID

Date Time Signature

17 Comp.

18 Grab

TDS

Hg - 245.1

Metals\*

Se, soluble

Se, speciation - vendor to AS&C (important to place filled bottle back into both baggies)

2011009703  
704  
705  
706  
707  
708  
709

B06792  
B07793  
B07108  
B07144

FGD Purge Eff  
EQ Tank Eff.  
BioReactor 1 Inf  
BioReactor 2 Inf  
BioReactor 2 Eff  
Filter Blk  
Metals Trip Blk

5/11/11 0800 Tim Owens  
5/11/11 0800 Tim Owens  
5/11/11 0800 Tim Owens  
5/11/11 0800 Tim Owens  
5/11/11 0800 Tim Owens  
5/3 0800 R. L. Davis  
5/3 0800 R. L. Davis

✓

✓

1

1

1

1

1

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1

1) Relinquished By **David Morris** Date/Time **5/11/11 09:15** 2) Accepted By **David Morris** Date/Time **5-11-11 1145**  
3) Relinquished By **David Morris** Date/Time **5-11-11 1210** 4) Accepted By **David Morris** Date/Time **5-11-11 1210**  
5) Relinquished By **David Morris** Date/Time **5-11-11 2245** 6) Accepted By **David Morris** Date/Time **5-11-11 1245**  
7) Relinquished By **David Morris** Date/Time **5-11-11 2245** 8) Accepted By **David Morris** Date/Time **5-11-11 1330**  
9) Seal/Locked By **David Morris** Date/Time **5-11-11 1330** 10) Seal/Lock Opened By **David Morris** Date/Time **5-11-11 1330**  
11) Seal/Locked By **David Morris** Date/Time **5-11-11 1330** 12) Seal/Lock Opened By **David Morris** Date/Time **5-11-11 1330**  
Comments **\* Metals=As, Ag, B, Cu, Cr, Ni, Se, Zn \* thomas.d.johnson@siemens.com**

Customer, IMPORTANT!  
Please indicate desired turnaround.

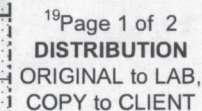
22 Requested Turnaround  
14 Days \_\_\_\_\_  
7 Days \_\_\_\_\_  
48 Hr \_\_\_\_\_  
Other **5/22/11** ✓  
\* Add. Cost Will Apply

Temp = 0.0°C

Bag label indicates sample collected on 5/11/2011



## Page 26 of 27



**Customer to complete all appropriate non-shaded areas.**

Sampling conducted: 2nd and 4th Wednesday

**Customer, IMPORTANT!**  
Please indicate desired turnaround.

**22 Requested Turnaround**

14 Days \_\_\_\_\_

\*7 Days \_\_\_\_\_

\* 48 Hr \_\_\_\_\_

\*Other \_\_\_\_\_

\* Add. Cost Will Apply



# CHAIN OF CUSTODY RECORD AND ANALYSIS REQUEST FORM



**Duke Energy Analytical Laboratory**  
 Mail Code MGO3A2 (Building 7405)  
 13339 Hagers Ferry Rd  
 Huntersville, N. C. 28078  
 (704) 876-5245  
 Fax: (704) 876-4349

## Analytical Laboratory Use Only

LIMS # <b>511050020</b>	Sample Class <b>Other</b>	Samples Originating From <b>NC SC</b>
Logged By <b>am</b>	Date & Time	SAMPLE PROGRAM Water: <b>Ground</b> Drinking Water RCRA Waste
Vendor <b>Brooks Rand ISW01.1946</b>	Cooler Temp (C)	
Preserv.: 1=HCl 2=H <sub>2</sub> SO <sub>4</sub> 3=HNO <sub>3</sub> 4=Ice 5=None		

Analytical Lab  
 Page 27 of 27

Page 2 of 2  
**DISTRIBUTION**  
 ORIGINAL to LAB,  
 COPY to CLIENT

Customer must Complete

1) Project Name <b>Belews - FGD</b>	2) Phone No:
3) Client: <b>WWTS (2010, Bi-Weekly Sampling)</b>	4) Fax No:
5) Business Unit: <b>Bill Kennedy, Melonie Martin, Wayne Chapman, Tom Johnson *</b>	Mail Code:
6) Oper. Unit:	9) Res. Type:
	10) Reso. Center:

Customer to complete all appropriate non-shaded areas.

Sampling conducted: 2nd Wednesday each month

Se Speciation Bottle ID	13 Sample Description or ID	Date	Time	Signature	17 Comp.	18 Grab	19 Hg 1631 (sample 2nd week)
	BioReactor 1 Inf	5/11/11	0800	Tim Owens	✓		1
	Hg Blk BioReactor 1 Inf	5/11/11	0800	Tim Owens			1
	BioReactor 2 Inf	5/11/11	0800	Tim Owens	✓		1
	Hg Blk BioReactor 2 Inf	5/11/11	0800	Tim Owens			1
	BioReactor 2 Eff	5/11/11	0800	Tim Owens	✓		1
	Hg Blk BioReactor 2 Eff	5/11/11	0800	Tim Owens			1

Use the Bioreactor 2 Inf or EFF sample as the MS/MSD

Customer to sign & date below - fill out from left to right.

1) Relinquished By <i>[Signature]</i>	Date/Time <b>5/11/11 09:15</b>	2) Accepted By <i>[Signature]</i>	Date/Time <b>5-11-11 11:45</b>
3) Relinquished By <i>[Signature]</i>	Date/Time <b>5-11-11 12:10</b>	4) Accepted By <i>[Signature]</i>	Date/Time <b>5-11-11 12:10</b>
5) Relinquished By <i>[Signature]</i>	Date/Time <b>5-11-11 2:45</b>	6) Accepted By <i>[Signature]</i>	Date/Time <b>5-11-11 12:45</b>
7) Relinquished By <i>[Signature]</i>	Date/Time	8) Accepted By	Date/Time
9) Seal/Locked By <i>[Signature]</i>	Date/Time	10) Seal/Lock Opened By	Date/Time
11) Seal/Locked By	Date/Time	12) Seal/Lock Opened By	Date/Time

Customer, IMPORTANT!  
 Please indicate desired turnaround.

22 Requested Turnaround

14 Days \_\_\_\_\_

\* 7 Days \_\_\_\_\_

\* 48 Hr \_\_\_\_\_

\* Other \_\_\_\_\_

\* Add. Cost Will Apply

\* Metals=As, Ag, B, Cu, Cr, Ni, Se, Zn \*thomas.d.johnson@siemens.com